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Grazing Incidence Optics

Grazing incidence optical systems are used to gather and focus radiation at extremely short wavelengths where more conventional optical systems are ineffective. The Electro-Optics Division of Kollsman Instrument Corporation has successfully developed the design and fabrication techniques required to produce such systems for use with light energy below 1000 Å in wavelength.

The term "grazing incidence optics" defines a system in which the gathering and focusing of radiation, such as extreme ultraviolet and X-ray, is performed by reflective optical elements oriented to collect incoming energy at angles of incidence approaching the tangential. The system elements are made with aspheric surfaces.

More conventional optical systems are highly inefficient in the shorter wavelength region because of the reflectively scattered light (high absorption). The use of multi-element optics minimizes the pronounced off-axis aberrations normally found in images produced at grazing incidence by a single-element optical system.

Precision Techniques

The fabrication of surfaces for grazing incidence optics requires high orders of competence in the design and fabrication of aspheric surfaces. Kollsman optical engineering and production personnel have had extensive experience in the grinding, electroforming and polishing of such surfaces from many different materials. For these operations, Kollsman opticians have developed special machinery to produce surfaces of the required geometric configuration and finish. Equally important are the instruments used to measure geometric shape and surface polish. In order to perform these measurements, Kollsman has made design changes and modifications of standard laboratory grade instruments and also has developed special instruments.

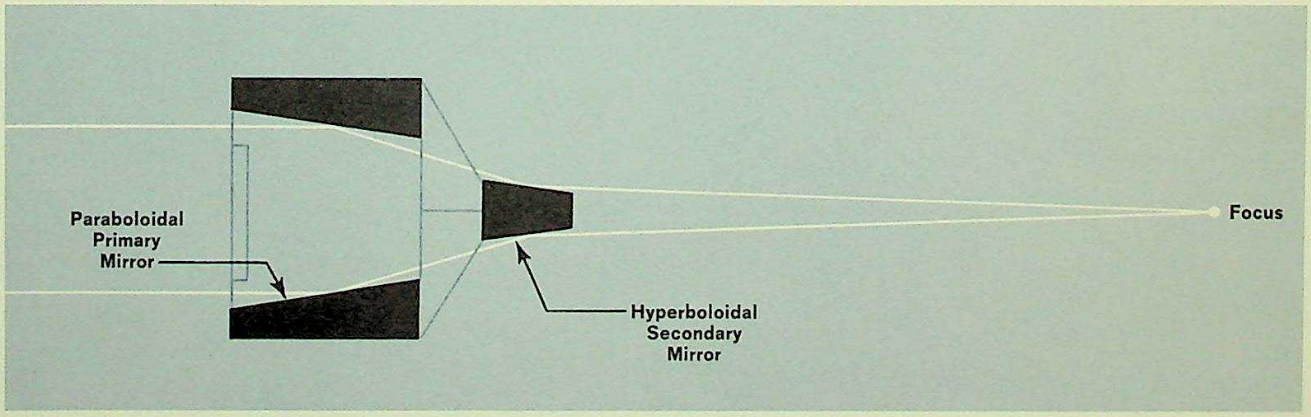
Kollsman's design personnel have developed the computer design routines necessary to design these complex aspheric surfaces. The computer FORTRAN program provides complete implementation of these design equations.

Exploring New Spectral Regions

Grazing incidence optical systems are intended for use in telescopes to gather data in spectral regions not available through more conventional systems. Studies of the sun and other celestial bodies from the surface of the earth has been hampered in the region below 2900 Å because of absorption in the upper atmosphere. Direct mounting of grazing incidence optical systems in rockets and satellites has allowed such studies to be made at the short wavelengths by focusing the gathered light onto a plane surface such as a photographic emulsion.

Kollsman's Optical Design and Fabrication Capabilities Include:

- Precision Machining for the Generation of Aspheric Surfaces
- Optical Skills for Achieving Precision Figuring
- Computer Programming for the Analysis of Advanced Optical Systems



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